REMARKS

Reconsideration of this application is respectfully requested.

Claims 1, 5-9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tinney, US Patent No. 6,543,394 as evidenced by Clark et al., US Patent Application Publication No. 2005/0241216. This rejection is respectfully traversed.

Before responding to the rejection, the background and the features of the present invention are explained below.

The DLC material used in the system having DLC contact surfaces according to the present invention has been developed as a hard coating material which gives an excellent anti-wear property and a low frictional coefficient to the parts in engines or the like under severe frictional wearing, as described on page 2 of the specification. It is known that the DLC material has a lower frictional coefficient in the air in the absence of a lubricant, compared to other anti-wearing hard coating materials, but can offer only limited friction reducing effect in the presence of a lubricant.

Further, as described on pages 2 to 3 of the specification, it is known that sufficient friction reducing effect cannot be achieved by providing the DLC contact surfaces with a lubricant containing an organic molybdenum compound, such as molybdenum dithiocarbamate (MoDTC) and molybdenum dithiophosphate (MoDTP), which, though, impart particularly excellent low frictional coefficient to conventional steel contact surfaces, among various friction modifiers capable of sufficiently lowering the frictional coefficient on such steel contact surfaces.

That is, in the background of the present invention, there was a problem that even a lubricant containing a friction modifier which exhibits excellent lowering of the frictional coefficient on steel surfaces, does not have a frictional coefficient reducing effect on DLC contact surfaces.

In the light of this problem, according to the present invention set forth in claim 1, it has been discovered that excellent friction reducing property is achieved in lubricating DLC contact surfaces as well as in lubricating both DLC contact surfaces and non-DLC contact surfaces together,

by employing a particular lubricant which contains a lubricant base oil (A) containing the particular base oil (Xl, and a sulfur-containing molybdenum complex (B) as essential components, wherein the base oil (X) consists of at least one of a hydrocracked mineral oil, a wax-isomerized mineral oil and a poly-α-olefin base oil, and has the particular kinematic viscosity, total aromatic content, and total sulfur content. These effects are unexpected to one of ordinary skill in the art in the light of the background art discussed above, and are specifically demonstrated in Examples and Comparative Examples in the present specification, and are particularly shown in Table 1.

Turning to the Office Action, to establish a prima facie case of obviousness, three basic criteria must be met. first, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success of the combination. Finally, the combination of references must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in the Applicants' disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Here, the applicants submit that the Examiner has failed to establish a proper motivation for combining the cited references.

The Examiner points out in paragraph 3 of the Office Action (with respect to the present rejection) that Tinney discloses an internal combustion engine which has certain load bearing surfaces including a hard coating material such as a diamondlike coating, and in which the fuel serves as the lubricant and the combustive agent (claim 1).

However, Tinney does not disclose any Example specifically demonstrating that the fuel serving as the lubricant and the combustive agent exhibited an excellent low frictional coefficient in lubricating DLC surfaces.

In paragraph 3 of the Office Action, the Examiner further points out that Tinney discloses the use of molybdenum disulfide as a possible additive, which corresponds to the sulfur-containing molybdenum complex (B) recited in claim 1 of the present application.

However, as described from page 14, line 24 to page 15, line 15 of the present specification, the sulfur-containing molybdenum complex (B) as defined in the present application is a complex of a molybdenum compound (such as molybdenum disulfide) and a sulfur-containing organic compound or other organic compounds. Specific examples of the complex (B) are listed on page 15, lines 16 to 27, from which it is clear that molybdenum disulfide is different from the complex (B).

Therefore, Tinney is totally silent about the use of sulfur-containing molybdenum complex (B), which is an essential component of the lubricant in the present invention.

On the other hand, Clark discloses a diesel oil fuel composition and does not teach anything about a lubricant or the sulfur-containing molybdenum complex (B) contained therein, as defined in claim 1 of the present application.

Thus, neither Tinney or Clark teaches or suggests component (B) of the present invention.

Incidentally, the Examiner points out that Tinney discloses use of Fischer-Tropsch fuel, which is taught in Clark to have essentially no or undetectable levels of sulfur, for lubricating a hard material such as a DLC coating.

However, according to the present invention, the base oil is defined as having at least one of a hydrocracked mineral oil, a wax-isomerized mineral oil, and a poly-α-olefin base oil. Fischer-Tropsch fuel is irrelevant to the present invention.

The Examiner further points out that the fuel of Tinney is taught to have a viscosity in the range of about 1.5 to 4.5 cSt, which range overlaps with the range including kinematic viscosity of 2 to 20 mm2/s at 100 °C as recited in the claims of the present application.

However, Tinney does not disclose the temperature conditions for the viscosity. In that case, it is reasonable to take the temperature as room temperature, and then the viscosity disclosed in Tinney is clearly outside the viscosity range defined in the present claims.

Thus, neither Tinney or Clark teaches or suggests component (A) of the present invention.

Therefore, it is respectfully submitted that claims 1, 5-9 and 16 are not obvious over Tinney in view of Clark. Withdrawal of this ground for rejection is believed to be in order.

The rejection of claims 2-4, 10-12, 14-15 and 17 under 35 U.S.C. 103(a) as being unpatentable over Tinney, in view of Yagishita, US Patent Application Publication No. 2005/0272616 is respectfully traversed.

The Examiner points out that Yagishita discloses a low sulfur lubricant composition for use in an internal combustion engine, wherein the base oil can be derived from hydrocracking and produced by isomerizing GTL wax, and which composition may further comprise a neutral alkaline earth metal salicylate (a sulfur-free metal detergent), friction modifiers which include aliphatic amines, and sulfur-free phosphorous anti-wear agents.

However, Yagishita merely discloses a lubricant composition which has oxidation stability in the presence of water, and only the oxidation stability tests were conducted in the Examples. This reference does not teach or even suggest to lower the frictional coefficient.

Further, even if the disclosed lubricant composition may impart a low frictional coefficient to steel materials, there is no suggestion that the lubricant composition could impart a low frictional coefficient to contact surfaces including DLC contact surfaces, as to which it is hard to lower the frictional coefficient, as discussed above.

Please note that, Yagishita discloses at paragraph [0061] that molybdenum dithiophosphate (MoDTP) and molybdenum dithiocarbamate (MoDTe), which correspond to component (B) of the present invention, may be added to the lubricant composition as a friction modifier. However, this reference does not disclose even a single Example which employs these components, and is silent about lubrication of contact surfaces including DLC contact surfaces.

In the light of the background of the present invention discussed above, one of ordinary skill in the art would not have applied MoDTP or MoDTC disclosed in Yagishita to the fuel of Tinney for the purpose of imparting friction lowering effect to the contact surfaces including DLC contact surfaces. Moreover, the effects obtained from the lubricant composition of the present invention cannot be determined at all from these references, and are unexpected.

Based on the arguments set forth above, claims 2-4, 10-12, 14-15 and 17 of the present application are not obvious over Tinney in view of Yagishita.

Claims 1-13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shirahama et al., US Patent Application Publication No. 2003/0162672. This ground for rejection is not believed to be well taken and is respectfully traversed.

Shirahama discloses a low-friction sliding mechanism comprising first and second sliding members slidable relative to each other and a lubricant being applied to the sliding surfaces of the sliding members. The first sliding member is made of a DLC material and the second is made of an ironbased material. The lubricant applied between the sliding members can be a synthetic lubricant, preferably a polyalphaolefin, wherein the base oil has an aromatic content of preferably 8 % or less, and kinematic viscosity of preferably between 2 and 20 mm2/s. The sulfur content of the base oil is not mentioned. Shirahama further discloses the use of MoDTC (paragraph [0044]) and zinc dithiophosphate (paragraph [0037]).

However, Shirahama does not disclose any Example wherein MoDTe, which corresponds to component (B) of the present invention, is used. MoDTC is used only in Comparative Example 3 (Lubricant I), as pointed out by the Examiner. However, the base oil used therein has a total aromatic content of 5.5 %, which is outside the range called for in the present claims, and the total sulfur content is not disclosed. With such a composition, the frictional coefficient is as high as 0.095 as shown in Table 1, so that the friction reducing effect is not exhibited. Thus, Shirahama teaches that use of MoDTC inhibits the friction reducing effect.

That is, though Shirahama teaches the use of MoDTC, the reference is totally silent about the claimed combination of MoDTC with the particular base oil for achieving the friction reducing effect. Still more, Shirahama clearly teaches away from the present invention.

Therefore, pending claims 1-13 and 16 are not obvious over Shirahama.

Claims 1-2, 4-6, 8-10, 12 and 14 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2, 4-6, 8-10, 12 and 14 of copending Application No. 10/566,915.

In response to this rejection, a Terminal Disclaimer over co-pending application 10/566,915 is being submitted along with this response.

Based on the preceding comments, the pending claims are believed to be in condition for allowance and such action is earnestly solicited.

Dated: March 9, 2009

Respectfully submitted,

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